NMME Monthly / Seasonal Forecasts for NASA SERVIR Applications Science

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This work details use of the North American Multi-Model Ensemble (NMME) experimental forecasts as drivers for Decision Support Systems (DSSs) in the NASA / USAID initiative, SERVIR (a Spanish acronym meaning "to serve"). SERVIR integrates satellite observations, ground-based data and forecast models to monitor and forecast environmental changes and to improve response to natural disasters. Through the use of DSSs whose "front ends" are physically based models, the SERVIR activity provides a natural testbed to determine the extent to which NMME monthly to seasonal projections enable scientists, educators, project managers and policy implementers in developing countries to better use probabilistic outlooks of seasonal hydrologic anomalies in assessing agricultural / food security impacts, water availability, and risk to societal infrastructure. The multi-model NMME framework provides a "best practices" approach to probabilistic forecasting.

The NMME forecasts are generated at resolution more coarse than that required to support DSS models; downscaling in both space and time is necessary. The methodology adopted here applied model output statistics where we use NMME ensemble monthly projections of sea-surface temperature (SST) and precipitation from 30 years of hindcasts with observations of precipitation and temperature for target regions. Since raw model forecasts are well-known to have structural biases, a cross-validated multivariate regression methodology (CCA) is used to link the model projected states as predictors to the predictands of the target region. The target regions include a number of basins in East and South Africa as well as the Ganges / Baramaputra / Meghna basin complex. The MOS approach used address spatial downscaling. Temporal disaggregation of monthly seasonal forecasts is achieved through use of a tercile bootstrapping approach. We interpret the results of these studies, the levels of skill by several metrics, and key uncertainties.